A. MATHEMATICAL PROCESSES

***Content Standard**:* Students in Wisconsin will draw on a broad body of mathematical knowledge and apply a variety of mathematical skills and strategies, including reasoning, oral and written communication, and the use of appropriate technology, when solving mathematical, real-world and non-routine problems.

***Rationale**:* In order to participate fully as a citizen and a worker in our contemporary world, a person should be mathematically powerful. Mathematical power is the ability to explore, to conjecture, to reason logically, and to apply a wide repertoire of methods to solve problems. Because no one lives and works in isolation, it is also important to have the ability to communicate mathematical ideas clearly and effec*tively.*

***Performance Standards*: By the end of grade four, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
A.4.1. Use reasoning abilities to [3] • perceive patterns • identify relationships • formulate questions for further exploration • justify strategies • test reasonableness of results	1. Recognize, identify, and justify patterns[3] 2. Recognize and/or generate a step by step process in reasoning[3]	1.a. Complete an established pattern using pictures, blocks, or numbers(2) 2.a. Sequence a problem's steps using pictures and simple phrases(2) 2.b. Identify, select, and demonstrate appropriate strategies for problem solving(3)	
A.4.2. Communicate mathematical ideas in a variety of ways, including words, numbers, symbols, pictures, charts, graphs, tables, diagrams, and models[2]	1. Exhibit knowledge of various mathematical functions[1] 2. Share different ways of communicating mathematical terms[2] 3. Recognize various items for mathematical concepts (e.g., subtraction: minus, take way, what is	1.a. Make a chart exhibiting student characteristics such as height, age, number of siblings. Fractions or percentages could be found for other characteristics such as eyecolor, clothing, interests(2) 2.a. Through shared writing, (3) 2.b. Illustrate a story problem(2) 3.a. Illustrate "How many more?" through pictures(2)	

	left?)[1]		
A.4.3. Connect mathematical learning with other subjects, personal experiences, current events, and personal interests[3] • see relationships between various kinds of problems and actual events • use mathematics as a way to understand other areas of the curriculum (e.g., measurement in science, map skills in social studies)	1. Link mathematics to everyday experiences(3) 2. Identify mathematical usage in content areas[3]	1.a. Measure and record a family receipt 1.b. Students will purchase items from a classroom store using US currency(3) 2.a. Explain the relationship between actual size and representation (e.g., mapping - size of map compared to real area [geography])(2) 2.b. Create a life-sized model of a living object from a scale model(4)	
A.4.4. Use appropriate mathematical vocabulary, symbols, and notation with understanding based on prior conceptual work[1]	1. Demonstrate knowledge of mathematical vocabulary[1]	1.a. Use a variety of terms and symbols for one mathematical concept (e.g., addition, +, plus, and how much/many total altogether)(1) 1.b. Demonstrate, with manipulatives, L_1 (native language) or L_2 (English), sketching, computation, and the mathematical process(1)	
A.4.5. Explain solutions to problems clearly and [3]	1. Give oral mathematical presentations with graphic support[3]	1.a. Identify, organize, and report solutions to problems in L_1 (native language) or L_2 (English) with graphic or pictorial support (written support optional)(3) 1.b. Solve story problems (e.g., The 4th graders are putting on the picnic for the school. There are 240 hot dogs and 240 buns. Each student needs 8 oz of juice. How many packages of hot dogs & buns and gallons of juice they should buy? Hints: 10 hot dogs in a pack; 8 buns in a bag; and 128 ounces of juice in a gallon.)(3)	
***Performance Standards*: By the end of grade eight, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***

A.8.1. Use reasoning abilities to[3] • evaluate information • perceive patterns • identify relationships • formulate questions for further exploration • evaluate strategies • justify statements • test reasonableness of results • defend work	1. Apply strategies, patterns, and relationships and show why they were selected to solve a problem[4] 2. Provide a reasonable explanation of work[3]	1.a. Maintain a math journal of mathematical process (in L_1, native language or L_2, English language), pictures, or drawings(3) 2.b. Compare prices of similar products and indicate the one to buy(2)	
A.8.2. Communicate logical arguments clearly to show why a result makes sense[2]	1. Exhibit rationale for the mathematical process[2] 2. Develop a logical sequence for results[3]	1.a. Select and justify telephone call charges (e.g., Company A charges $1.50 for the first 10 minutes and 10 cents per minute thereafter; Company B charges a flat rate of 20 cents per minute based on the number of minutes)(2) 2.a. Solve problems of the following types: Using a timeladder sequencing map, cause and effect map, or other chart/graph, trace the buying and selling patterns of a ship captain who regularly sails between India and Europe, exchanging goods. Consider the interest on the profits he might acquire or other potential "investments" this captain might make(3)	
A.8.3. Analyze non-routine problems by modeling, illustrating, guessing, simplifying, generalizing, shifting to another point of view, etc.[3]	1. Examine mathematical representations[2] 2. Explore complex strategies for solving problems[3]	1.a. Given a specific problem, identify which of various graphs represent the problem. (May need to read the problem to the student in L_1 or L_2. Problem might also be taped.)(2) 2.a. Solve problems of the following type: How many thumbtacks are needed to put 12 sheets of paper on the bulletin board?(2)	
A.8.4. Develop effective oral and written presentations that include[3] • appropriate use of	1. Display knowledge of mathematical processes through oral or written presentations[]	1.a. Write and/or illustrate a mathematical idea or procedure and present it to the class(3) 2.a. Make a poster of a mathematical concept, process or	

technology • the conventions of mathematical discourse (e.g., symbols, definitions, labeled drawings • mathematical language • clear organization of ideas and procedures • understandings of purpose and audience	2. Convey a message in mathematical terms[3]	figure (e.g., poster on volume would show various containers and amount held in each and why)(3) 2.b. Use a computer to construct graphs representing data(2)	
A.8.5. Explain mathematical concepts, procedures, and ideas to others who may not be familiar with them[3]	1. Express mathematical concepts and procedures in L_1 (native language) and L_2 (English) with graphics or pictures[2]	1.a. Solve problems of the following type: The 8th grade students are raising money for a class trip. They are going to make crispy bars. The recipe to make 12 bars is: • 3/4 of a stick of butter, • 40 large marshmallows, and • 6 cups of Rice Krispies They need 540 servings. The butter is sold in boxes of 4 sticks in a pound. There are 60 marshmallows in a bag. One large box of Rice Krispies contains 12 cups. How many containers of each should they buy?	
A.8.6. Read and understand mathematical texts and other instructional materials and recognize mathematical ideas as they appear in other contexts[2]	1. Read and understand mathematical texts and other instructional materials and recognize mathematical ideas as they appear in other contexts[2]	1.a. Solve problems of the following type: Compare and contrast video rental options • Block Buster charges a $1.00 rental fee per video and $5.00 membership fee per year • Mega video charges a $1.50 per video with no membership fee • which video store gives you the better deal? Justify your choice Read/tape the problem. Use L_1 or L_2 to present the problem(3)	
***Performance Standards*: By the end of grade twelve, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
A.12.1. Use reason and logic to	1. Apply reasoning and logic to solve real problems	1.a. Discuss and roleplay solutions to issues (e.g., purchasing a car, world population, family expenses: rent	

• evaluate information • perceive patterns • identify relationships • formulate questions, pose problems, and make and test conjectures • pursue ideas that lead to further understanding and deeper insight	2. Compare equations	comparisons, check book, classified advertising, grocery, and budget) 2.a. Analyze mathematical terms, convey understanding (math or oral language), and demonstrate using manipulatives.	
A.12.2. Communicate logical arguments and clearly show • why a result does or does not make sense • why the reasoning is or is not valid • an understanding of the difference between examples that support a conjecture and a proof of the conjecture	1. Distinguish between various mathematical results 2. Formulate and demonstrate mathematical skills in reasoning	1.a. Compare and contrast various credit card financing 2.a. Analyze graphs, charts, and tables 2.b. Explain solutions in L_1 (native language) or L_2 (English)	
A.12.3. Analyze non-routine problems and arrive at solutions by various means, including models and simulations, often starting with provisional conjectures and progressing, directly or indirectly, to a solution, justification, or counter-example	1. Examine mathematical representations 2. Explore complex strategies for solving problems	1.a. Solve problems of the following type: How many sheets of paper are needed to cover the gym floor? 2.a. Solve problems of the following type: Determine the cost of a 10-day car trip for four to California (e.g., gas, motel, food, entertainment, and emergency)	
A.12.4. Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical	1. Present high-level mathematical concepts	1.a. Collect, analyze, organize, and present data on a subject of students' choice (e.g., monthly budget)	

arguments and display of data			
A.12.5. Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly	1. Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly	1.a. Solve problems of the following type: You and three other 12th graders are planning a graduation party. Your parents have put you in charge with the only restriction that each of you can spend no more than $50. You plan to invite 35 of your friends including the four of you. Based on the following information, determine the amount of each item to buy and the amount of money to spend # of servings • Chips $7.99 per 27-ct case 27 • Soda $1.19 per 2 liter bottle 4 • Cheese Pizza $9.00 for large (16 inches) 4 • Sausage Pizza $11.00 for large (16 inches) 4 • Cake $15.00 for 9 x 12 inches 24	
A.12.6. Read and understand • mathematical texts and other instructional materials • writing about mathematics, e.g., articles in journals • mathematical ideas as they are used in other contexts	1. Read and understand • mathematical texts and other instructional materials • mathematical ideas as they are used in other contexts	1.a. Given a specific amount of money, demonstrate the ability to budget for apartment rental, utility bills, food, clothing, and entertainment 1.b. Read and discuss journals or articles on employment, demographics, and income	